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*Journal of Physiotherapy* 2017, 63(4), 267-267.

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**DOI link to article:**

<https://doi.org/10.1016/j.jphys.2017.08.003>

**Date deposited:**

17/10/2017



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## Lacey Assessment of Preterm Infants

We are planning a study to investigate the predictive accuracy of the Lacey Assessment of Preterm Infants (LAPI) with regards to the diagnosis of cerebral palsy at 2 years corrected age. For the purpose of a power calculation we referred to Table 4 in the original paper by Lacey and colleagues,<sup>1</sup> and discovered errors in the calculation of the 95% confidence limits around the estimates of sensitivity, specificity, positive and negative predictive value. The interval estimates used in the original paper were too narrow for two reasons: (1) because the authors appear to have calculated Wald intervals, and (2) because there were errors in their calculations.

In order to demonstrate this, we have reproduced below Table 3 from the original paper to show the raw data (Table 1). We then reproduced the original confidence intervals from Table 4 in the paper (Table 2).

We then compared the original confidence intervals from Table 4 in the original paper with confidence intervals calculated using the online clinical calculator found on the VassarStats

website<sup>2</sup> and confirmed using Stata 14.x (StataCorp LLC) (Table 2). This used the efficient-score method described by Robert Newcombe,<sup>3</sup> based on the procedure outlined by Wilson in 1927,<sup>4</sup> to calculate the 95% confidence intervals for proportions, which is an appropriate method for sensitivity, specificity, and positive and negative predictive values. As Newcombe noted in his 1998 paper,<sup>3</sup> the familiar Gaussian approximation  $p \pm 1.96 \times \sqrt{p(1-p)/n}$  is ill suited to situations where the proportion is quite small, as is often the case with prevalence measures, or quite large, as is optimally the case with measures of sensitivity and specificity.

The 95% confidence intervals in Lacey and colleagues' paper appear to be too narrow in several cases: for sensitivity given 'unusual or abnormal' LAPI categories, our interval is 86 (95% CI 69 to 95) compared with 86 (95% CI 80 to 92), and for PPV our interval is 57 (95% CI 42 to 70) compared with 57 (95% CI 49 to 65).

It is important to consider the clinical relevance of this finding. The LAPI assessment is used in the UK and current teaching is based on the findings reported in this paper. The strengths of the LAPI are related to its specificity and its ability to correctly identify the proportion of infants without cerebral palsy. In the neonatal unit, the LAPI may be used longitudinally to monitor the development of preterm infants over time. In this instance, the assessment may be used to facilitate discussion between therapists and parents of preterm infants, as well as to assist clinical decision-making. However, if clinicians are purely using this assessment as a diagnostic tool, they need to be aware that the results may not be as precise as initially described.

Currently, the only other data that have been published investigating the diagnostic accuracy of the LAPI are those in a small retrospective review.<sup>5</sup> It is therefore important to highlight that further robust studies are needed to evaluate the LAPI's diagnostic capabilities.

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**Table 1**

Reproduction of Table 3 from the original paper by Lacey and colleagues,<sup>1</sup> showing the raw data used in the calculation of confidence intervals.

LAPI category	No cerebral palsy	Cerebral palsy	Totals
Normal	90	4	94
Unusual	17	10	27
Abnormal	2	15	17
Totals	109	29	138

**Table 2**

Reproduction of Table 4 from the original paper by Lacey and colleagues,<sup>1</sup> showing the original confidence intervals and recalculations of the confidence intervals as discussed in the text.

Statistic	Mean (95% CI)	
	Unusual or abnormal	Abnormal
Sensitivity (%)	86 (80 to 92)	52 (43 to 60)
	86 (69 to 95)	52 (34 to 69)
Specificity (%)	83 (76 to 89)	98 (96 to 100)
	83 (74 to 89)	98 (94 to 99)
PPV (%)	57 (49 to 65)	88 (83 to 94)
	57 (42 to 70)	88 (66 to 97)
NPV (%)	96 (92 to 99)	88 (83 to 94)
	96 (90 to 98)	88 (82 to 93)

Shading indicates the recalculated data.

## References

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